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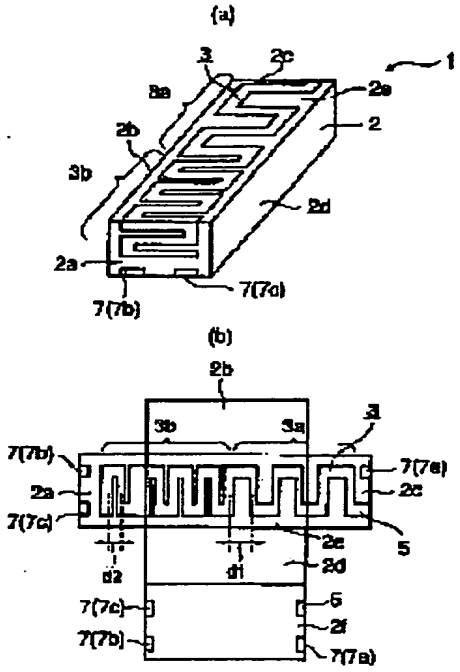
(54) SURFACE MOUNTED ANTENNA AND COMMUNICATION UNIT USING THE SAME

(57)Abstract:
PROBLEM TO BE SOLVED: To provide an antenna that can send/receive a radio wave with a plurality of different frequency bands.
SOLUTION: A meandering radiating electrode 3 is formed from a front end face 2a of a rectangular parallelepiped dielectric base 2 toward its rear end face 2c via an upper face 2e. The radiating electrode 3 consists of a 1st electrode 3a with a 1st meandering pitch d1 and a 2nd electrode 3b with a 2nd meandering pitch d2 that is narrower than the 1st meandering pitch d1. The radiating electrode 3 has two resonance frequencies with the 1st electrode 3a and the 2nd electrode 3b whose meandering pitches differ from each other, and then the surface mount antenna 1 can send/receive a radio wave with two different frequency bands thereby.



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* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] It is the surface mount type antenna which transmits and receives the electric wave of two frequency bands which change at least with radiation electrodes formed in the front face of a rectangular parallelepiped-like dielectric base. The MIANDA-like 1st polar zone in which the above-mentioned radiation electrode was formed in the 1st MIANDA pitch, It has at least the 2nd polar zone of the shape of MIANDA formed in the 2nd MIANDA pitch narrower than the above-mentioned 1st MIANDA pitch. A radiation electrode is a surface mount type antenna characterized by for the 1st polar zone of the above and the 2nd polar zone accomplishing with the radiation electrode of the shape of MIANDA connected in series, and forming them or more in the 2nd of the front end side of the above-mentioned dielectric base, the upper surface, and back end sides.
[Claim 2] The surface mount type antenna according to claim 1 characterized by forming in the front face of a dielectric base one or more non-supplied electric power radiation electrodes which carry out an electromagnetic coupling to a radiation electrode, and having accomplished with the double resonance state by the above-mentioned non-supplied electric power radiation electrode by at least one frequency band in two or more frequency bands of a surface mount type antenna.
[Claim 3] A non-supplied electric power radiation electrode is a surface mount type antenna according to claim 2 characterized by having accomplished with the MIANDA-like non-supplied electric power radiation electrode.
[Claim 4] A non-supplied electric power radiation electrode is a surface mount type antenna according to claim 2 or 3 characterized by being crossed and formed in a page [2nd / or more] field, the upper surface of a dielectric base, and the side.
[Claim 5] It is the surface mount type antenna according to claim 3 or 4 characterized by forming the non-supplied electric power radiation electrode in the upper surface at least at the radiation electrode and the part in which it differed of a dielectric base, and forming the pattern of the shape of MIANDA of a non-supplied electric power radiation electrode the MIANDA-like pattern and the letter of an abbreviation rectangular cross of a radiation electrode.
[Claim 6] It is the surface mount type antenna of any one publication of the claim 1 which accomplishes a radiation electrode with the composition by which flow connection is made with the source of an electric power supply through a matching circuit, and is characterized by preparing the above-mentioned matching circuit in the dielectric base, or the claim 5.
[Claim 7] The surface mount type antenna which is a surface mount type antenna which transmits and receives the electric wave of two different frequency bands at least, and is characterized by establishing a means to make the double resonance state in at least one frequency band in two or more frequency bands of the above-mentioned surface mount type antenna, and to attain wide band-ization.
[Claim 8] The transmitter using the surface mount type antenna which carries out the feature of being equipped with the surface mount type antenna of any one publication of a claim 1 or the claim 7 on a mounting substrate, and changing.

[Translation done.]

* NOTICES *

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] this invention relates to the transmitter using the surface mount type antenna and it which are built in transmitters, such as carried type telephone.
[0002]
[Description of the Prior Art] An example of the surface mount type antenna built in transmitters, such as a portable telephone, is typically shown in drawing 16 . This surface mount type antenna 1 has the dielectric base 2, and the radiation electrode 3, the grounding electrode 4, and the electric supply electrode 5 are formed in the front face of this dielectric base 2. That is, the radiation electrode 3 is hung and formed in side 2c through side 2b from side 2a of the dielectric base 2, it flows through a grounding electrode 4 in the above-mentioned radiation electrode 3, and it is formed in all the fields of 2d of sides of the dielectric base 2. Moreover, the electric supply electrode 5 is formed in side 2a of the dielectric base 2 through the radiation electrode 3 and the interval.
[0003] It is the composition that flow connection of the external electric power supply means (source of an electric power supply) 6 is made at the above-mentioned electric supply electrode 5, and if power is supplied to the electric supply electrode 5 from this electric power supply means 6, power will be supplied to the radiation electrode 3 by capacity coupling from the electric supply electrode 5. The radiation electrode 3 excites by this supply voltage, and the surface mount type antenna 1 transmits and receives the electric wave of one frequency band which becomes settled beforehand.
[0004]
[Problem(s) to be Solved by the Invention] By the way, two frequency bands, a 900MHz band and a 1.9GHz band, may be used as a use frequency band of carried type telephone now.
[0005] However, with the surface mount type antenna 1 shown in aforementioned drawing 16 , although the surface mount type antenna which can transmit and receive the electric wave of two frequency bands which are different with one antenna was required of the transmitter which can use such two different frequency bands, as mentioned above, only transmission and reception of the electric wave of one frequency band were able to be performed.
[0006] this invention is accomplished in order to solve the above-mentioned technical problem, and the purpose is in offering the transmitter using the surface mount type antenna and it which can transmit and receive the electric wave of two or more different frequency bands.
[0007]
[Means for Solving the Problem] In order to attain the above-mentioned purpose, this invention is taken as a means to solve the aforementioned technical problem with the composition shown below. Namely, the surface mount type antenna of the 1st invention It is the surface mount type antenna which transmits and receives the electric wave of two frequency bands which change at least with radiation electrodes formed in the front face of a rectangular parallelepiped-like dielectric base. The MIANDA-like 1st electrode section in which the above-mentioned radiation electrode was formed in the 1st MIANDA pitch, It has at least the 2nd electrode section of the

shape of MIANDA formed in the 2nd MIANDA pitch narrower than the above-mentioned 1st MIANDA pitch. The above-mentioned 1st electrode section and the 2nd electrode section accomplish a radiation electrode with the radiation electrode of the shape of MIANDA connected in series, and make it a means to solve the aforementioned technical problem with the composition by which it is formed or more in the 2nd of the front end side of the above-mentioned dielectric base, the upper surface, and back end sides.

[0008] It has the composition of invention of the above 1st, one or more non-supplied electric power radiation electrodes which carry out an electromagnetic coupling to a radiation electrode are formed in the front face of a dielectric base, and the surface mount type antenna of the 2nd invention is constituted from at least one frequency band in two or more frequency bands of a surface mount type antenna by the above-mentioned non-supplied electric power radiation electrode considering having accomplished with the double resonance state as a feature.

[0009] The surface mount type antenna of the 3rd invention is equipped with the composition of invention of the above 2nd, and it constitutes having accomplished the non-supplied electric power radiation electrode with the MIANDA-like non-supplied electric power radiation electrode as a feature.

[0010] The surface mount type antenna of the 4th invention is equipped with the composition of the above 2nd or the 3rd invention, and it constitutes as a feature that the non-supplied electric power radiation electrode is gone across and formed in a page [2nd / or more] field, the upper surface of a dielectric base, and the side.

[0011] It constitutes as a feature that the surface mount type antenna of the 5th invention is equipped with the composition of the above 3rd or the 4th invention, the non-supplied electric power radiation electrode is formed in the upper surface at least at the radiation electrode and the part in which it differed of a dielectric base, and the pattern of the shape of MIANDA of a non-supplied electric power radiation electrode is formed the MIANDA-like pattern and the letter of an abbreviation rectangular cross of a radiation electrode.

[0012] The surface mount type antenna of the 6th invention is equipped with the composition of any one invention of the above 1st - the 5th invention, a radiation electrode is accomplished with the composition by which flow connection is made with the source of an electric power supply through a matching circuit, and it constitutes as a feature that the above-mentioned matching circuit is prepared in the dielectric base.

[0013] The surface mount type antenna of the 7th invention is a surface mount type antenna which transmits and receives the electric wave of two different frequency bands at least, and it constitutes as a feature that a means to make the double resonance state in at least one frequency band in two or more frequency bands of the above-mentioned surface mount type antenna, and to attain wide band-ization is established.

[0014] The transmitter using the surface mount type antenna of the 8th invention is constituted considering being equipped with the surface mount type antenna which constitutes any one invention of the above 1st - the 7th invention on a mounting substrate, and changing as a feature.

[0015] In invention of the above-mentioned composition, the MIANDA-like 1st electrode section and the MIANDA-like 2nd electrode section have accomplished at least the radiation electrode formed in the front face of a dielectric base with the radiation electrode of the shape of MIANDA connected in series. As for the MIANDA-like electrode section, resonance frequency becomes settled with a MIANDA pitch and the number of turns (electric merit). This radiation electrode will have two or more resonance frequency by connecting in series two or more electrode sections from which a MIANDA pitch differs like this invention, and constituting a radiation electrode from this. For this reason, the surface mount type antenna of this invention becomes possible [transmitting and receiving the electric wave of the frequency band from which plurality differs]. Moreover, since the transmitter of this invention can cover two or more frequency bands with one antenna, the miniaturization of it is attained.

[0016]

[Embodiments of the Invention] Below, the example of an operation form concerning this invention is explained based on a drawing.

[0017] The surface mount type antenna in the 1st example of an operation form is shown to drawing 1 (a) by the typical perspective diagram, and the surface form of the dielectric base which constitutes the surface mount type antenna of the 1st example of an operation form is shown in drawing 1 (b) in the state of expansion.
[0018] As shown in drawing 1 (a) and (b), the surface mount type antenna 1 shown in this 1st example of an operation form has the dielectric base 2, hangs it on back end side 2c through front end side 2a to upper surface 2e of this dielectric base 2, and the MIANDA-like radiation electrode 3 is formed.
[0019] 1st electrode section 3a and 2nd electrode section 3b from which a MIANDA pitch differs are connected in series, and the radiation electrode 3 of the shape of this MIANDA is constituted. The MIANDA pitch (it is hereafter described as the 1st MIANDA pitch) d1 of the above-mentioned 1st electrode section 3a is larger than the MIANDA pitch (it is hereafter described as the 2nd MIANDA pitch) d2 of 2nd electrode section 3b.
[0020] The 2nd MIANDA pitch d2 and the number of turns of 1st MIANDA pitch [of the above-mentioned 1st electrode section 3a] d1 and number of turns, and 2nd electrode section 3b are defined as shown below. For example, as shown in drawing 2 , when making a return loss low by two different frequency bands of the 1st frequency band f1 (for example, 900MHz band) and the 2nd frequency band f2 (for example, 1.9GHz band) higher than this 1st frequency band f1 that is, the case where the surface mount type antenna 1 which can transmit and receive an electric wave is required by the above-mentioned frequency bands f1 and f2 is taken for an example. In this case, the 2nd MIANDA pitch d2 and the number of turns of the 2nd electrode section 3b are defined so that 2nd electrode section 3b with the narrower MIANDA pitch of the above-mentioned 1st electrode section 3a and the 2nd electrode section 3b can have the resonance frequency f2 shown in drawing 2 .
[0021] Moreover, there is a correlation which can be found beforehand in the ratio of the above-mentioned 1st MIANDA pitch d1 and the 2nd MIANDA pitch d2, and the frequency f1 shown in drawing 2 and the interval H between f2. From this, the 1st MIANDA pitch d1 of the above-mentioned 1st electrode section 3a is defined based on this correlation and the 2nd MIANDA pitch d2 which becomes settled like ****. Furthermore, the number of turns of the above-mentioned 1st electrode section 3a is defined so that 2nd electrode section 3b can resonate by resonance frequency f1 by electrode [1st] section [of the above] 3a Reaching in both. In addition, although narrow 2nd electrode section 3b of a MIANDA pitch is formed over the 2nd page of the dielectric base 2 in the example of drawing 1 , it is making it concentrate only on the 1st page (2a), and has the feature of being easy to perform control of the above-mentioned resonance frequency f1 and f2.
[0022] As shown in drawing 1 (b), the electric supply electrode 5 which makes flow connection is formed in 1st electrode section 3a of the above-mentioned radiation electrode 3 at back end side 2c of the above-mentioned dielectric base 2. Moreover, fixed electrode 7a is formed in the above-mentioned radiation electrode 3, the electric supply electrode 5, and the part in which it differed at back end side 2c of the dielectric base 2.
[0023] Furthermore, fixed electrodes 7b and 7c are formed in the field which counters the open end of the radiation electrode 3 at front end side 2a of the dielectric base 2, respectively. The above-mentioned electric supply electrode 5 and fixed electrodes 7a, 7b, and 7c turn to no less than 2f of bases of the dielectric base 2, and are formed in them, respectively.
[0024] The surface mount type antenna 1 shown in this 1st example of an operation form is mounted in the circuit board 8 of a transmitter, as it is constituted as mentioned above, for example, is shown in drawing 3 . That is, this circuit board 8 has principal part 8a by which it is constituted by PCB etc. and the grounding electrode 10 is formed in the front face, and non-grand section 8b in which the grounding electrode is not formed, and is constituted. In the example shown in drawing 3 , the above-mentioned surface mount type antenna 1 is mounted in the above-mentioned non-grand section 8b.
[0025] The electric power supply means 6 and matching circuit 11 which are a source of an electric power supply for making the above-mentioned surface mount type antenna 1 drive are prepared in the above-mentioned circuit board 8. By carrying out the surface mount of the

surface mount type antenna 1 to the predetermined mounting position of the above-mentioned non-grand section 8b, flow connection of the electric supply electrode 5 is made through a matching circuit 11 at the electric power supply means 6. Power is supplied to the radiation electrode 3 through a matching circuit 11 and the electric supply electrode 5 in order from the above-mentioned electric power supply means 6, and if the radiation electrode 3 electrode [1st] section 3a Reaches based on this power and 2nd electrode section 3b excites both, the transmission and reception of the electric wave in the 1st frequency band f1 of the surface mount type antenna 1 will be attained. Moreover, if only 2nd electrode section 3b of the radiation electrode 3 excites based on the above-mentioned supply voltage, the transmission and reception of the electric wave in the 2nd frequency band f2 of the above of the surface mount type antenna 1 will be attained.

[0026] According to this 1st example of an operation form, since 1st electrode section 3a and 2nd electrode section 3b from which a MIANDA pitch differs connect in series and the radiation electrode 3 is constituted, it will have [this radiation electrode 3] two different resonance frequency. By this, the transmission and reception of the electric wave in two different frequency bands of the surface mount type antenna 1 of this 1st example of an operation form are attained.

[0027] Moreover, in this 1st example of an operation form, the radiation electrode 3 is composition gone across and formed not only in one field of the dielectric base 2 but in two or more fields. From this, the formation field of the radiation electrode 3 will be expanded rather than the case where the formation field of the radiation electrode 3 is only the field of one ** of the dielectric base 2. For this reason, without being greatly regulated by the length of the radiation electrode 3, the miniaturization of the dielectric base 2 can be attained and the flexibility of a design of the surface mount type antenna 1 can be raised. In addition, although narrow 2nd electrode section 3b of a MIANDA pitch is formed over the 2nd page of the dielectric base 2 in this 1st example of an operation form, you may make it concentrate only on the 1st page (2a). Thus, the aforementioned resonance frequency f1 and f2 can be made easy to control, in concentrated and forming 2nd electrode section 3b only in the 1st page of the dielectric base 2.

[0028] Below, the 2nd example of an operation form is explained. In addition, in explanation of this 2nd example of an operation form, the same sign is given to the same component as the example of an operation form of the above 1st, and duplication explanation of the intersection is omitted.

[0029] As the example of an operation form of the above 1st described, the transmission and reception of the electric wave in two different frequency bands f1 and f2 of the surface mount type antenna 1 are attained by constituting the radiation electrode 3 of the surface mount type antenna 1 by the two electrode sections 3a and 3b from which a MIANDA pitch differs. However, one bandwidth of the above-mentioned frequency bands f1 and f2 may be narrower than desired width of face.

[0030] Then, in this 2nd example of an operation form, in order to expand the bandwidth of a frequency band with bandwidth narrower than the bandwidth of the above-mentioned request, it had composition as shown below. The surface form of the dielectric base which constitutes the surface mount type antenna of the 2nd example of an operation form is shown in drawing 4 in the state of expansion. In this 2nd example of an operation form, it is characterized by forming the non-supplied electric power radiation electrode 12 as shown in drawing 4 in the dielectric base 2. This non-supplied electric power radiation electrode 12 is formed in the direction which goes to the side 2b side from 2d side of sides at upper surface 2e of the dielectric base 2 in the shape of MIANDA. Moreover, it hangs on 2d of sides from 2f of bases of the dielectric base 2, introductory pattern 12a is formed, flow connection of the end side of the non-supplied electric power radiation electrode 12 of the shape of above-mentioned MIANDA was made at the above-mentioned introductory pattern 12a, and the other end side has accomplished with the open end.

[0031] The MIANDA pitch and the number of turns of the above-mentioned non-supplied electric power radiation electrode 12 are defined as shown below. For example, if it puts in

another way, the MIANDA pitch and the number of turns of the non-supplied electric power radiation electrode 12 are defined [to expand the bandwidth of the frequency band f1 of the aforementioned frequency bands f1 and f2] to attain wide band-ization so that it may have frequency f1' [resonance frequency / of the radiation electrode 3 shown in drawing 5 (a) / f1] slightly shifted as resonance frequency. Thus, when it has with the MIANDA pitch and the number of turns which were defined and the non-supplied electric power radiation electrode 12 is formed, in the aforementioned frequency band f1, the radiation electrode 3 has a return loss property like the solid line of drawing 5 (a). Moreover, on the other hand, the above-mentioned non-supplied electric power radiation electrode 12 will have a return loss property like the dotted line of drawing 5 (a). By the frequency band f1, it will be from this in the double resonance state as shown in drawing 5 (b) by the above-mentioned radiation electrode 3 and the non-supplied electric power radiation electrode 12.

[0032] Moreover, the MIANDA pitch and the number of turns of the non-supplied electric power radiation electrode 12 are defined to expand the bandwidth of the above-mentioned frequency band f2 so that it may have frequency f2' [resonance frequency / of the radiation electrode 3 shown in drawing 5 (a) / f2] slightly shifted as resonance frequency. Thus, if the non-supplied electric power radiation electrode 12 is formed with the MIANDA pitch and the number of turns which were defined, the above will be the same in the double resonance state by the frequency band f2.

[0033] As shown in drawing 4 , in this 2nd example of an operation form, the electric supply electrode 5 approaches the aforementioned introductory pattern 12a, and is hung and formed in 2f of bases from 2d of sides of the dielectric base 2. Like the example of an operation form of the above 1st, 1st electrode section 3a and 2nd electrode section 3b from which a MIANDA pitch differs mutually are connected in series, and the radiation electrode 3 is constituted. The radiation electrode 3 of the shape of the MIANDA is hung and formed in side 2a from upper surface 2e of the dielectric base 2. That is, the pattern of the shape of MIANDA of the radiation electrode 3 is mostly formed in the shape of a rectangular cross through MIANDA-like the pattern and interval of the aforementioned non-supplied electric power radiation electrode 12. Flow connection of the end side of this radiation electrode 3 was made at the above-mentioned electric supply electrode 5, and the other end side has accomplished with the open end.

[0034] Moreover, as shown in drawing 4 , fixed electrodes 7a and 7b are formed in side 2b of the dielectric base 2 through an interval, respectively, and fixed electrodes 7c and 7d are formed in 2d of sides, respectively. From side 2b, these fixed electrodes 7a, 7b, 7c, and 7d turn to 2f of bases, and are formed in them, respectively.

[0035] The surface mount type antenna 1 shown in this 2nd example of an operation form is constituted as mentioned above. This surface mount type antenna 1 is mounted in non-grand section 8b of the circuit board 8 like the example of an operation form of the above 1st, as shown in drawing 6 . Thus, flow connection of the aforementioned radiation electrode 3 is made through the electric supply electrode 5 and a matching circuit 11 at the electric power supply means 6 by mounting the surface mount type antenna 1 in the circuit board 8. Moreover, flow connection is made at the grounding electrode 10 of the circuit board 8, and fixed electrodes 7a, 7b, 7c, and 7d and introductory pattern 12a are grounded in a gland.

[0036] Thus, if power is supplied to the electric supply electrode 5 of the surface mount type antenna 1 through a matching circuit 11 in the state where the surface mount type antenna 1 is mounted, from the above-mentioned electric power supply means 6, while the power is supplied to the radiation electrode 3 from the electric supply electrode 5, power will be supplied also to the above-mentioned introductory pattern 12a by the electromagnetic coupling from the electric supply electrode 5. When the radiation electrode 3 excites by the above-mentioned supply voltage, the transmission and reception of the electric wave in frequency bands f1 and f2 of the surface mount type antenna 1 are attained. Moreover, if the non-supplied electric power radiation electrode 12 excites based on the above-mentioned supply voltage, in a frequency band f1 or a frequency band f2, it will be in the double resonance state and, thereby, bandwidth will be expanded (wide band-ization is attained).

[0037] According to this 2nd example of an operation form, it is the composition which forms the

non-supplied electric power radiation electrode 12 in the front face of the dielectric base 2, and is made into the double resonance state by this non-supplied electric power radiation electrode 12 by one side of the frequency bands f1 and f2 which can transmit and receive the surface mount type antenna 1. For this reason, it is possible to extend the bandwidth of the frequency band of the request of the frequency bands f1 and f2, and wide band-ization can be attained.
[0038] Moreover, in this 2nd example of an operation form, the pattern of the shape of MIANDA of the radiation electrode 3 and the pattern of the shape of MIANDA of the non-supplied electric power radiation electrode 12 are mostly formed in the shape of a rectangular cross. For this reason, excitation of the radiation electrode 3 can avoid the interference problem which has a bad influence on excitation of the non-supplied electric power radiation electrode 12, and can consider as the double resonance state certainly by the desired frequency band. Thereby, degradation of the antenna property by interference between the radiation electrode 3 and the non-supplied electric power radiation electrode 12 can be prevented.
[0039] Below, the 3rd example of an operation form is explained. In addition, in explanation of this 3rd example of an operation form, the same sign is given to the same component as each aforementioned example of an operation form, and duplication explanation of the intersection is omitted.
[0040] The surface form of the dielectric base which constitutes the surface mount type antenna of the 3rd example of an operation form is shown in drawing 7 according to the expansion state. In this 3rd example of an operation form, a characteristic thing is that the 1st non-supplied electric power radiation electrode 13 and the 2nd non-supplied electric power radiation electrode 14 are formed, as shown in drawing 7 .
[0041] In this 3rd example of an operation form, as shown in drawing 7 , the MIANDA-like radiation electrode 3 is hung and formed in side 2b from upper surface 2e of the dielectric base 2. This radiation electrode 3 is put, it is made like, and the non-supplied electric power radiation electrode 13 of the above 1st and the 2nd non-supplied electric power radiation electrode 14 are formed, respectively. That is, the non-supplied electric power radiation electrode 13 of the above 1st is formed in the shape of MIANDA over side 2a from upper surface 2e of the dielectric base 2. Moreover, the 2nd non-supplied electric power radiation electrode 14 is formed in the shape of MIANDA over side 2c from upper surface 2e of the dielectric base 2. Thus, the pattern of the shape of each MIANDA of the 1st non-supplied electric power radiation electrode 13 and the 2nd non-supplied electric power radiation electrode 14 is mostly formed in the shape of a rectangular cross through MIANDA-like the pattern and interval of the radiation electrode 3.
[0042] Each MIANDA pitch and the number of turns of the non-supplied electric power radiation electrode 13 of the above 1st and the 2nd non-supplied electric power radiation electrode 14 are defined as shown below. For example, by two different frequency bands f1 and f2, the surface mount type antenna 1 makes an example the case where he wants to expand the bandwidth of both above-mentioned frequency bands f1 and f2, when it can transmit and receive. In this case, the MIANDA pitch and the number of turns are defined so that one of the non-supplied electric power radiation electrode 13 of the above 1st and the 2nd non-supplied electric power radiation electrode 14 may have frequency f1' [resonance frequency / of the radiation electrode 3 shown in drawing 8 (a) / f1] slightly shifted as resonance frequency. Moreover, the MIANDA pitch and the number of turns are defined by the other side so that it may have frequency f2' [resonance frequency / of the radiation electrode 3 / f2] slightly shifted as resonance frequency.
[0043] Moreover, the case where he wants to expand the bandwidth of one frequency band f1 of the above-mentioned frequency bands f1 and f2 is made into an example. In this case, the MIANDA pitch and the number of turns are defined so that one of the non-supplied electric power radiation electrode 13 of the above 1st and the 2nd non-supplied electric power radiation electrode 14 may have frequency f1' only predetermined deltaf shifted ['] from the resonance frequency f1 of the radiation electrode 3 shown in drawing 8 (b) as resonance frequency.
moreover -- the other side -- the above -- resonance frequency -- f -- one -- from -- the above -- delta -- f -- differing -- delta -- f -- ' -- only -- having shifted -- frequency -- f -- one -- ' -- ' -- resonance frequency -- ****** -- having -- as -- the -- MIANDA -- a pitch -- and -- a turn -- a number -- setting -- having .

[0044] Furthermore, the case where he wants to expand the bandwidth of the above-mentioned frequency band f2 is made into an example. In this case, like the above, as shown in drawing 8 (c), the MIANDA pitch and the number of turns are defined so that one of the non-supplied electric power radiation electrode 13 of the above 1st and the 2nd non-supplied electric power radiation electrode 14 may have frequency f2' only predetermined deltaf shifted ['] from the resonance frequency f2 of the radiation electrode 3 as resonance frequency. moreover -- the other side -- the above -- resonance frequency -- f -- two -- from -- the above -- delta -- f -- differing -- delta -- f -- ' -- only -- having shifted -- frequency -- f -- two -- ' -- ' -- resonance frequency -- ****** -- having -- as -- the -- MIANDA -- a pitch -- and -- a turn -- a number -- setting -- having .

[0045] As mentioned above, by defining each MIANDA pitch and the number of turns of the 1st non-supplied electric power radiation electrode 13 and the 2nd non-supplied electric power radiation electrode 14, it can accomplish with the double resonance state by the frequency band of a request of the aforementioned frequency bands f1 and f2, and the bandwidth of a frequency band can be expanded.

[0046] In this 2nd example of an operation form, as shown in drawing 7 , the electric supply electrode 5 is hung and formed in 2f of bases from 2d of sides of the dielectric base 2, and fixed electrodes 7a and 7b are formed in side 2b of the dielectric base 2 through the interval, respectively. Moreover, 2d of sides of the dielectric base 2 is approached at the above-mentioned electric supply electrode 5, and fixed electrodes 7c and 7d are further formed for the introductory patterns 13a and 14a, respectively.

[0047] The above-mentioned fixed electrodes 7a, 7b, 7c, and 7d and the introductory patterns 13a and 14a turn to 2f of bases of the dielectric base 2, respectively.

[0048] The surface mount type antenna 1 shown in this 3rd example of an operation form is constituted as mentioned above, and this surface mount type antenna 1 is mounted in non-grand section 8b of the circuit board 8, as shown in drawing 9 . Thus, flow connection of the radiation electrode 3 will be made through the electric supply electrode 5 and a matching circuit 11 by mounting the surface mount type antenna 1 at the electric power supply means 6. Moreover, flow connection will be made at the grounding electrode 10 of the circuit board 8, and fixed electrodes 7a, 7b, 7c, and 7d and the introductory patterns 13a and 14a will be grounded in a gland.

[0049] According to this 3rd example of an operation form, the 1st non-supplied electric power radiation electrode 13 and the 2nd non-supplied electric power radiation electrode 14 were formed, and were considered as the composition which makes it the double resonance state by at least one frequency band of two different frequency bands. By this composition, by excitation of only the radiation electrode 3, it becomes possible to extend the bandwidth of the frequency band from which desired bandwidth is not obtained to desired width of face, and wide band-ization can be attained.

[0050] Moreover, in this 3rd example of an operation form, the pattern of the shape of MIANDA of the radiation electrode 3 and the pattern of the shape of each MIANDA of the 1st non-supplied electric power radiation electrode 13 and the 2nd non-supplied electric power radiation electrode 14 are mostly formed in the shape of a rectangular cross. And the open end of the 1st non-supplied electric power radiation electrode 13 and the open end of the 2nd non-supplied electric power radiation electrode 14 are composition which is formed in the side of the dielectric base 2 and strengthens capacity coupling with a gland. Excitation of the radiation electrode 3 can prevent more certainly the interference problem which has a bad influence on excitation of the 1st non-supplied electric power radiation electrode 13 or the 2nd non-supplied electric power radiation electrode 14, and can acquire the desired double resonance state from this. Thereby, degradation of the antenna property by interference between the radiation electrode 3, the 1st non-supplied electric power radiation electrode 13, or the 2nd non-supplied electric power radiation electrode 14 can be prevented.

[0051] Below, the 4th example of an operation form is explained. In this 4th example of an operation form, a characteristic thing is having formed the matching circuit 11 in the front face of the dielectric base 2. The other composition is the same as that of each aforementioned

example of an operation form, in this 4th example of an operation form, the same sign is given to the same component as each above-mentioned example of an operation form, and duplication explanation of the intersection is omitted.
[0052] In this 4th example of an operation form, as shown in drawing 10 (a) and drawing 11 (a), a matching circuit 11 connects with the electric supply electrode 5, and is formed in the front face of the dielectric base 2.
[0053] The equal circuit of a matching circuit 11 shown in drawing 10 (a) is shown in drawing 10 (b). As shown in this drawing 10 (b), the matching circuit 11 shown in drawing 10 (a) has consistency by Capacitor C. That is, the matching circuit 11 shown in this drawing 10 (a) has the capacitor which consists of conductor pattern 11b which counters the electric supply electrode 5 through a gap at conductor pattern 11a which makes flow connection, and this conductor pattern 11a, and is constituted.
[0054] Moreover, the equal circuit of the matching circuit 11 of drawing 11 (a) is shown in drawing 11 (b). As shown in this drawing 11 (b), the matching circuit 11 shown in drawing 11 (a) has consistency by Inductor L. That is, as shown in drawing 11 (a), a matching circuit 11 has the inductor constituted by MIANDA-like conductor pattern 11c, and is constituted.
[0055] According to this 4th example of an operation form, since the matching circuit 11 was formed in the dielectric base 2, the almost same effect as each aforementioned example of an operation form can be done so. The part which moreover becomes unnecessary to prepare a matching circuit 11 in the circuit board 8, and does not need to form a matching circuit 11, and the area in which the parts of the circuit board 8 are mounted can be made to reduce.
[0056] Moreover, the matching circuit 11 is constituted by conductor patterns 11a and 11b and conductor pattern 11c as mentioned above. Only by using printing technology etc. for the front face of the dielectric base 2, and forming the above-mentioned conductor patterns 11a and 11b and 11c in it by this composition, easily, a matching circuit 11 can be formed and reduction of a manufacturing cost can be aimed at with curtailment of part mark.
[0057] Below, the 5th example of an operation form is explained. This 5th example of an operation form shows the transmitter which built in the surface mount type antenna. In this 5th example of an operation form, a characteristic thing is that the surface mount type antenna 1 shown in each above-mentioned example of an operation form is built in. In addition, in explanation of this 5th example of an operation form, the same sign is given to the same component as each aforementioned example of an operation form, and duplication explanation of the intersection is omitted.
[0058] In this 5th example of an operation form, an example of the carried type telephone which is a characteristic transmitter is shown in drawing 15 . As shown in this drawing 15 , the mounting substrate (circuit board) 8 is formed in the case 21 of the carried type telephone 20, and the electric power supply means 6 is formed in this mounting substrate 8. The surface mount type antenna 1 is mounted in the ground plane (grounding electrode) 10 of the above-mentioned mounting substrate 8. This surface mount type antenna 1 is equipped with any one form in the form shown in each above-mentioned example of an operation form. The above-mentioned electric power supply means 6 is connected to the sending circuit 23 and the receiving circuit 24 through the switch circuit 22.
[0059] In the transmitter 20 shown in this drawing 5 , power is supplied to the surface mount type antenna 1 from the electric power supply means 6, antenna operation which was mentioned above is performed and transmission and reception of a signal are smoothly performed by switch operation of the switch circuit 22.
[0060] Since the surface mount type antenna 1 shown in each above-mentioned example of an operation form was built in according to this 5th example of an operation form, transmission and reception of the electric wave of two different frequency bands are attained only by using one antenna. The effect that the miniaturization of a transmitter 20 can be attained can be done so from this.
[0061] In addition, this invention is not limited to each above-mentioned example of an operation form, and can take the form of various operations. For example, in each above-mentioned example of an operation form, although the dielectric base 2 was a rectangular parallelepiped-

like, the shape for example, of a pillar and many prismatics are sufficient as the dielectric base 2.

[0062] moreover, above-mentioned the 1- in each 4th example of an operation form, although the surface mount type antenna 1 showed the example mounted in non-grand section 8b of the circuit board 8, it can apply this invention also to the surface mount type antenna 1 mounted on the grounding electrode 10 of the circuit board 8 as shown in drawing 12
[0063] Furthermore, although the radiation electrode 3 showed the example which the two electrode sections 3a and 3b from which a MIANDA pitch differs are connected in series, and changes in each above-mentioned example of an operation form, the radiation electrode 3 is good also as composition to which the three or more electrode sections from which a MIANDA pitch differs are connected in series. For example, as for the radiation electrode 3 shown in drawing 13 (a), the three different electrode sections 3a, 3b, and 3c of the MIANDA pitches d1, d2, and d3 are connected in series. In this case, by the radiation electrode 3, as shown in drawing 13 (b), the return loss of the radiation electrode 3 becomes low by three different frequency bands f1, f2, and f3, and the transmission and reception of an electric wave of the surface mount type antenna 1 are attained.
[0064] Furthermore, as shown in drawing 14 (a), (b), and (c), you may establish a hole 17 and a crevice 18 in the dielectric base 2. Thus, it becomes possible by establishing a hole 17 and a crevice 18 in the dielectric base 2 to do so the effect that lightweight-ization of the dielectric base 2 can be attained, and an effect as taken below. That is, a gland and a radiation inter-electrode dielectric constant fall, electric-field concentration is eased, and wide-band-izing and high interest profit-ization can be realized.
[0065] Furthermore, in each above-mentioned example of an operation form, although the radiation electrode 3 showed the example currently gone across and formed in two or more fields, it may form the radiation electrode 3 only in one field according to a MIANDA pitch, the number of turns, etc. of 1st electrode section 3a or 2nd electrode section 3b.
[0066] Furthermore, although the example of an operation form of the above 5th showed the example which builds in the surface mount type antenna 1 to carried type telephone, the surface mount type antenna of this invention can be built also in transmitters other than carried type telephone, and the effect of becoming possible to attain the miniaturization of a transmitter which was described above can be done so.
[0067]
[Effect of the Invention] Since according to this invention it connected in series and the electrode section of the two or more shape of MIANDA from which a MIANDA pitch differs formed the MIANDA-like radiation electrode, a radiation electrode will have two or more resonance frequency based on the electrode section of two or more shape of above-mentioned MIANDA. By this, the transmission and reception of the electric wave of at least two or more frequency bands of a surface mount type antenna are attained.
[0068] If it is in that by which the radiation electrode is formed in the 2nd [or more] page of a rectangular parallelepiped-like dielectric base, and the thing by which the non-supplied electric power radiation electrode is formed in the 2nd [or more] page of a dielectric base, compared with the case where a radiation electrode and a non-supplied electric power radiation electrode are formed only in the 1st page of a dielectric base, the formation field of a radiation electrode or a non-supplied electric power radiation electrode spreads. For this reason, the miniaturization of a dielectric base can be attained, without being greatly regulated by the size of a radiation electrode or a non-supplied electric power radiation electrode.
[0069] If it is in some which a non-supplied electric power radiation electrode is formed in the front face of a dielectric base, and are made into the double resonance state in at least one frequency band in two or more frequency bands of a surface mount type antenna When bandwidth is narrow and the frequency band of desired bandwidth is not obtained only by excitation of a radiation electrode, by the above-mentioned non-supplied electric power radiation electrode by making it the double resonance state in the frequency band of the narrow band width of face It becomes possible to be able to expand to the bandwidth of a request of the bandwidth of a frequency band, and to attain wide band-ization. Moreover, if it is in some in

which the means which makes the double resonance state in at least one frequency band in two or more frequency bands of a surface mount type antenna is prepared, wide band-ization can be attained by considering as the double resonance state like the above.

[0070] A non-supplied electric power radiation electrode is formed in the shape of MIANDA, and if the pattern of the shape of MIANDA of this non-supplied electric power radiation electrode and the pattern of the shape of MIANDA of a radiation electrode are in some which are mostly formed in the shape of a rectangular cross, the interference problem to which excitation of a radiation electrode has a bad influence on excitation of a non-supplied electric power radiation electrode is avoidable. If the open end of a non-supplied electric power radiation electrode is in some which are indirectly connected by the gland and capacity coupling especially, the above-mentioned interference problem can be more certainly prevented by capacity coupling of the open end and gland. Thus, since an interference problem can be prevented, excitation of a radiation electrode and excitation of a non-supplied electric power radiation electrode can be made to perform in independent, respectively. By this, it can be made the double resonance state by the predetermined frequency band by excitation of a radiation electrode, and excitation of a non-supplied electric power radiation electrode. Thereby, degradation of the antenna property by the radiation electrode and non-supplied electric power radiation inter-electrode interference can be prevented.

[0071] If it is in the thing in which the matching circuit was formed on the front face of a dielectric base, since it is not necessary to form the above-mentioned matching circuit in the circuit board which a surface mount type antenna mounts, a cost cut can be aimed at from both sides of part cost and mounting cost by reduction-izing of the area in which the parts of the circuit board are mounted, and curtailment of parts.

[0072] Since the transmitter using the surface mount type antenna of this invention can cover two or more frequency bands [use / one antenna], it can attain the miniaturization of the transmitter itself.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is explanatory drawing showing the surface mount type antenna shown in the 1st example of an operation gestalt.
[Drawing 2] It is explanatory drawing showing the example of a frequency band in the surface mount type antenna of the 1st example of an operation gestalt which can be transmitted and received.
[Drawing 3] It is explanatory drawing showing the example of mounting to the circuit board of the surface mount type antenna in the 1st example of an operation gestalt.
[Drawing 4] It is explanatory drawing showing the 2nd example of an operation gestalt.
[Drawing 5] It is explanatory drawing showing the example of a frequency band in the mounted type antenna of the 2nd example of an operation gestalt which can be transmitted and received.
[Drawing 6] It is explanatory drawing showing the example of mounting to the circuit board of the surface mount type antenna in the 2nd example of an operation gestalt.
[Drawing 7] It is explanatory drawing showing the surface mount type antenna of the 3rd example of an operation gestalt.
[Drawing 8] It is explanatory drawing showing the example of a frequency band in the surface mount type antenna of the 3rd example of an operation gestalt which can be transmitted and received.
[Drawing 9] It is explanatory drawing showing the example of mounting to the circuit board of the surface mount type antenna in the 3rd example of an operation gestalt.
[Drawing 10] It is explanatory drawing showing an example of the matching circuit which has [characteristic] consistency by the capacitor in the 4th example of an operation gestalt.
[Drawing 11] It is explanatory drawing showing an example of the matching circuit which has [characteristic] consistency by the inductor in the 4th example of an operation gestalt.
[Drawing 12] It is explanatory drawing showing an example at the time of mounting a surface mount type antenna on the grounding electrode of the circuit board.
[Drawing 13] It is explanatory drawing showing the other examples of an operation gestalt.
[Drawing 14] Furthermore, it is explanatory drawing showing the other examples of an operation gestalt.
[Drawing 15] It is explanatory drawing showing an example of the transmitter which built in the surface mount type antenna.
[Drawing 16] It is explanatory drawing showing the conventional example of a surface mount type antenna.
[Description of Notations]
1 Surface Mount Type Antenna
2 Dielectric Base
2a Front end side
2c Back end side
2e Upper surface
3 Radiation Electrode
3a The 1st polar zone

3b The 2nd polar zone
5 Electric Supply Electrode
6 Electric Power Supply Means
8 Circuit Board
11 Matching Circuit
12 Non-Supplied Electric Power Radiation Electrode
13 1st Nothing Electric Supply Radiation Electrode
14 2nd Nothing Electric Supply Radiation Electrode
20 Transmitter

[Translation done.]

* NOTICES *

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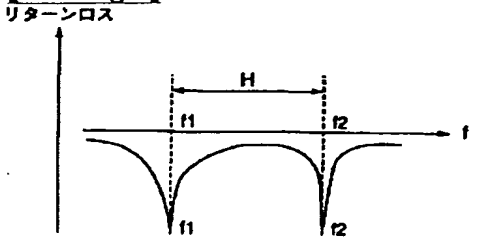
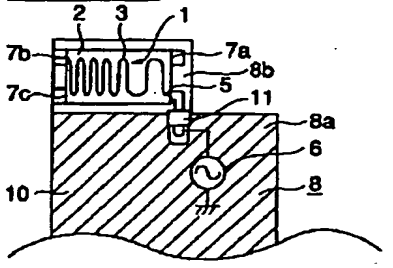
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

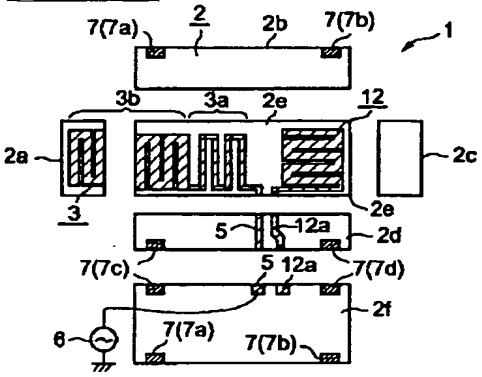
[Drawing 2]



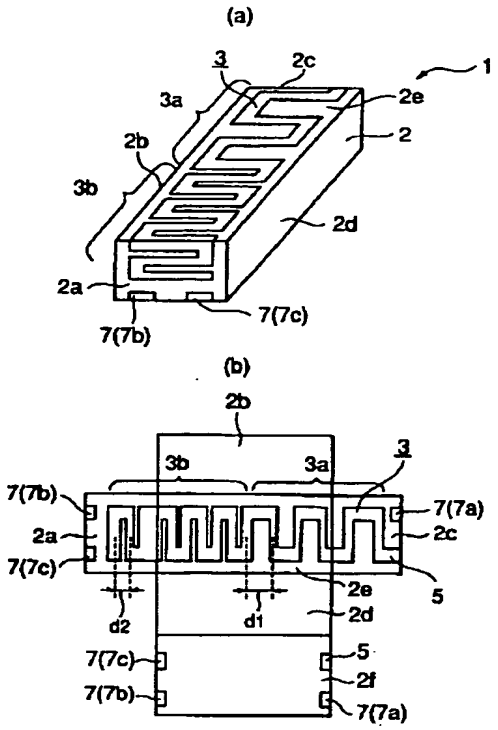
[Drawing 3]



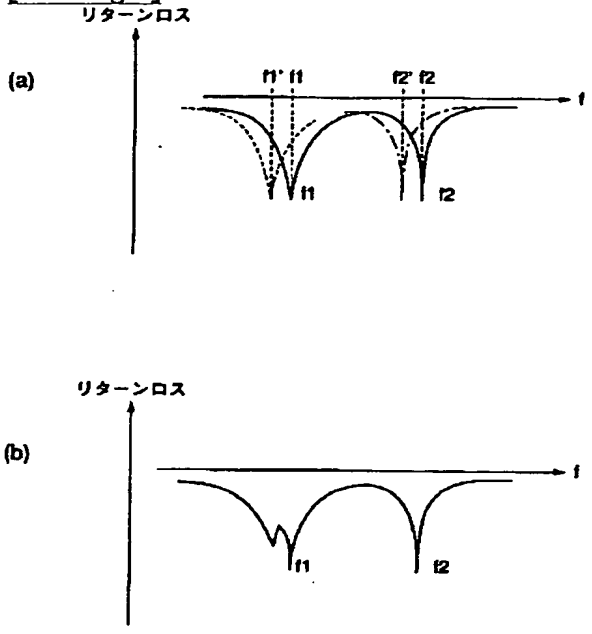
[Drawing 4]



[Drawing 1]



[Drawing 5]



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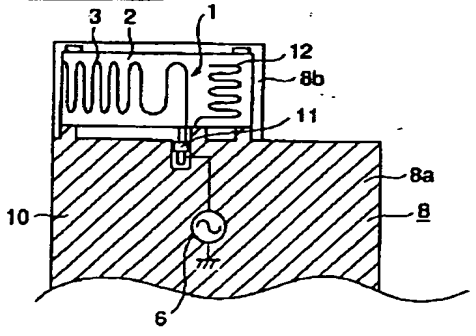

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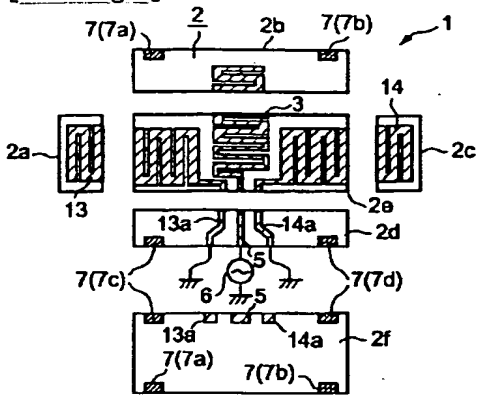
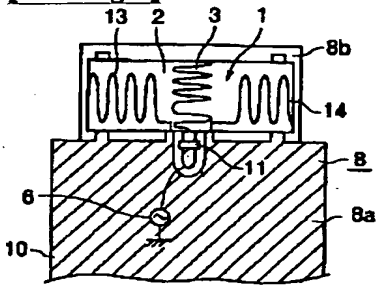
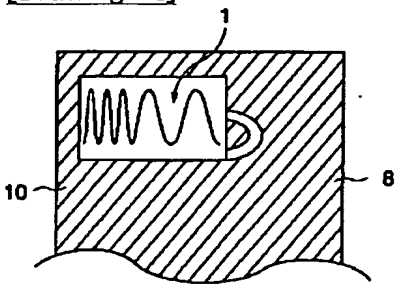


[Drawing 9]



[Drawing 12]



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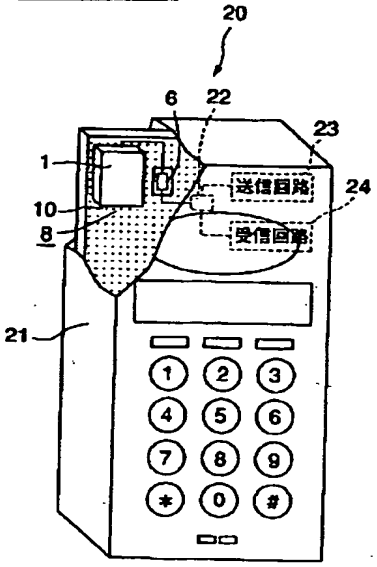
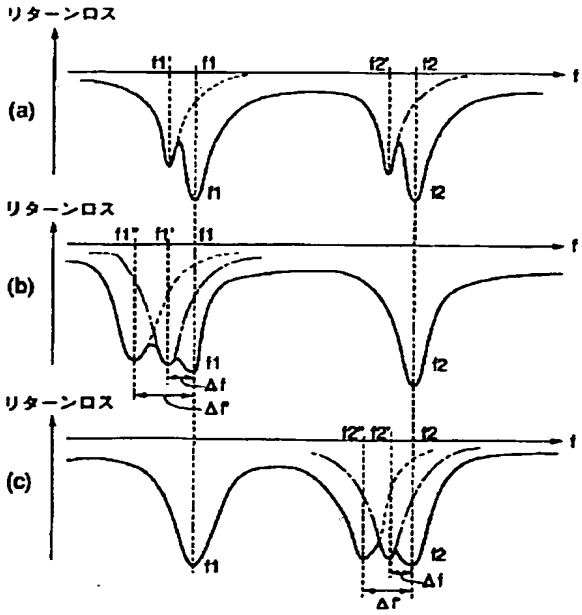
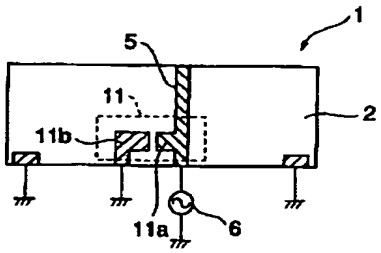


[Drawing 8]



[Drawing 10]

(a)



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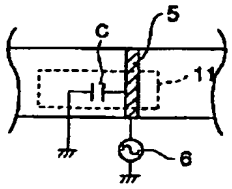
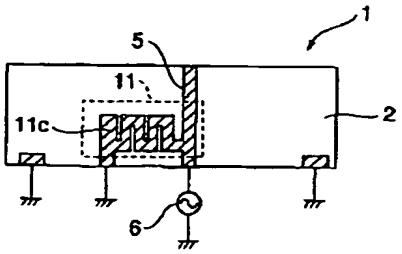


[Drawing 11]

(a)



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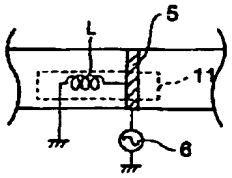
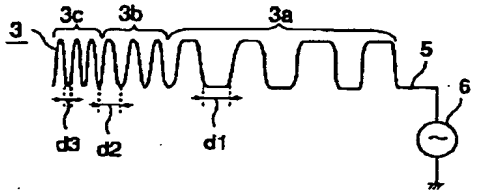


[Drawing 13]

(a)



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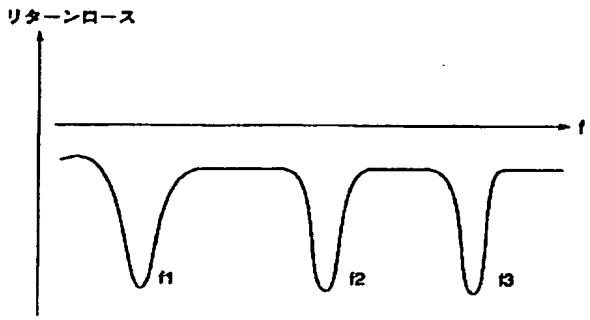
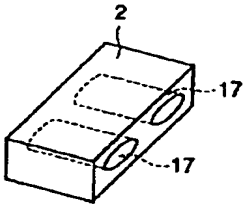


[Drawing 14]

(a)



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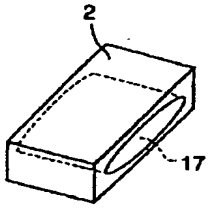

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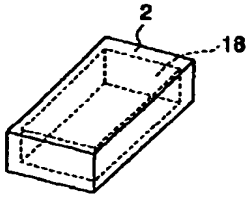
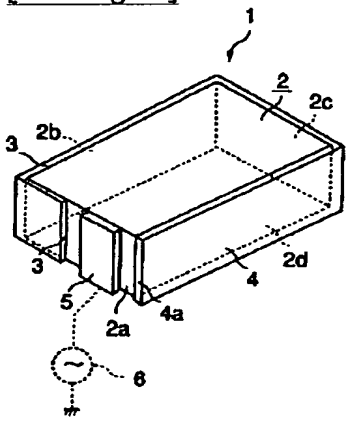


[Drawing 16]



[Translation done.]